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THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

Volume XXIII Number 2

February 1, 1939

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Volume XXIII Number 2

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RANGE EXTENSIONS FOR NAUCORIA CEREALIS IN ILLINOIS IN 1938 AND A KEY TO CERTAIN SPECIES IN THE GENUS

G. H. Boewe

In 1938 the writer[1] reported the occurrence of a new toadstool species, Naucoria cerealis, on wheat, barley, and rye. The known distribution of this fungus in Illinois has been extended, as a result of field work in 1938. It was found on rye in one field in Macoupin County and on wheat in five fields, one each in Champaign, Macoupin, Morgan, Washington, and White Counties, thus adding five new counties to its known range.

In studying this fungus, all available information on species of Naucoria known to be or indicated by description as possibly associated with living plants was brought together. From this the following key was prepared, and is presented here with the throught that it may be useful to others.

I. Sporophores small, with pilei commonly less than 1 cm. in diameter

A. Sporophores very small, with pilei 2 mm. in diameter; on stems of Chiliotrichum..... exquisita

B. Sporophores larger, with pilei 4-10 mm. in diameter

1. Gills adnexed

a. Stipes scaly, scurfy; on culms of "semi-living" Agrostis vulgaris..... pityrodes

b. Stipes pubescent to subglabrous

c. Stipes 3-4 cm. tall; spores 10-12 x 8-10 u; in upland Bermuda grass pasture..... pascuensis

d. Stipes 1.5-2.5 cm. tall; spores 6-7 x 4-5 u; on stalks and culms of grasses..... graminicola

2. Gills adnate

a. Stipes scaly

1/ Boewe, G. H. Naucoria on small grains in Illinois. Phytopath. 28: 852-855. Nov. 1938.

c. Stipes hollow, 2-2.5 cm. tall; among grasses..... sobria var. dispersa

d. Stipes stuffed, 1-2.5 cm. tall; on stems of ferns in Europe and Scolochloa festucacea in America.... siparia

b. Stipes without scales

c. Stipes glabrous; spores 7-9 x 4-5 u; on and among liverworts..... hepaticicola

d. Stipes villous; on culms of Bambusa arundinacea... trichialis

II. Sporophores larger, with pilei commonly 1 cm. and more in diameter

A. Sporophores of moderate size, with pilei commonly 1-5 cm. in diameter

1. Stipes commonly more than 5 cm. long

a. Gills adnexed; stipes stuffed, up to 13 cm. long; among grasses..... khasiensis

b. Gills adnate

c. Stipes flocculose, becoming hollow; on living sphagnum, other mosses, and rotten wood..... paludosella

d. Stipes hollow, longitudinally striate; in green vegetation..... striipes

2. Stipes commonly less than 5 cm. in length[2/]

a. Stipes commonly more than 2 mm. thick

c. Pilei glabrous

e. Pilei striate; stipes white-flocculose below; in lawns..... harperi

f. Pilei not striate; stipes hollow

2/ Not having seen a specimen, the writer has found it impossible to place N. laeta Lambotte definitely in the key from the description given in Saccardo. However, it comes in this section. The fungus has a glabrous pileus and free gills and grows under alders.

g. Spores 10 x 5 u; pilei 1-3 cm. in diameter; among thick grasses in meadow..... pampicola

h. Spores 7-8 x 4-5 u; pilei 3-3.5 cm. in diameter; on grassy soils near cypress trees.... pattersonae

d. Pilei scaly

e. Spores 15-20 x 9-12 u; stipes glabrous; on living stems of Musa..... musarum

f. Spores 9-10 x 4.5-5 u; stipes white-tomentose at base; in moist vegetation under alders exclusively..... suavis

b. Stipes up to 2 mm. in thickness

c. Stipes very short, .7-1 cm. long; in meadows among grasses..... brachypus

d. Stipes longer, 1-5 cm. long

e. Pilei minutely and thickly squamulose-verrucose; on mud of dry swamp..... siparioides

f. Pilei flocculose or glabrous

g. Pilei commonly flocculose

i. Margin of pileus striate; stipes 1-2.5 cm. long, 1-2 mm. thick; on dead leaf sheaths of Typha angustifolia..... typhicola

j. Margin of pileus not striate; stipes 3-4 cm. long and 1 mm. thick; on sugar cane stems..... sacchari

h. Pilei commonly glabrous

i. Gills adnexed; pilei may have few superficial scales; at base of stems of Scirpus validus..... scirpicola

j. Gills adnate

k. Stipes stuffed, rarely hollow with age; spores 9.9-16.5 x 6.6-9.9 u; on tillers, crowns, and roots of wheat, rye, and barley..... cerealis

1. Stipes hollow; pilei with brown margins

   m. Spores 8-9 x 5-6 u; stipes glabrous; among leaves and grasses on rich soils.. brunnei-marginata

   n. Spores 6-7 x 4 u; stipes velvety above, glabrous below; in lawns..... tubariiformis

B. Sporophore large, with pilei from 5-15 cm. in diameter

1. Pilei more than 10 cm. in diameter; gills adnexed; on withered grass..... pediades var. obscuripes

2. Pilei smaller, from 5-10 cm. in diameter

   a. Gills free; stipes thick, 8-10 mm. in diameter; on grassy earth..... lugubris

   b. Gills adnate; stipes thinner, 4-8 mm. in diameter; in open grassy places and compost heaps..... sororia

(Section of Applied Botany and Plant Pathology, Illinois State Natural History Survey, Urbana, Illinois).

OBSERVATIONS ON COTTON WILT IN RELATION TO NEMATODES AND CERTAIN MINERAL DEFICIENCIES

Paul R. Miller

Considerable progress has been made toward the production of satisfactory cotton varieties resistant to wilt (Fusarium vasinfectum), and farmers have been encouraged by extension staffs to substitute these varieties for susceptible ones in regions where the disease is prevalent. Nevertheless, wilt is still taking a rather heavy annual toll. One of the factors preventing a greater reduction in the loss is, of course, the considerable increase of the areas affected.

A survey was made during the period from July 22 to September 2 for the purpose of obtaining information as to the distribution, prevalence, and severity of wilt in conjunction with the amount of nematode infestation and the severity of certain mineral nutritional disturbances, including rust or potash deficiency and magnesium deficiency. Results are summarized in the accompanying maps, showing the average percentage of wilted plants (Fig. 1) and the average estimated loss (Fig. 2), based upon observations of a minimum of ten fields chosen at random in each county. Areas where potash

or magnesium deficiency symptoms were noted to be especially severe are also indicated in Figure 1.

The higher percentages of wilt observed in Mississippi and in the Piedmont areas as compared with the Coastal Plain of Alabama, Georgia, and South Carolina, may be explained by the fact that resistant varieties are more extensively utilized in the latter region where wilt is of long standing, while tolerant or susceptible varieties are grown in the former.

It is fully realized that at present we have no way of measuring accurately the real injury resulting from any disease producing such varied effects on the host as wilt does; however, the estimates given in the maps may have comparative value. The method utilized in arriving at the percentage of wilted plants was the rapid-scanning method plus enough counts to insure a fairly accurate figure. The loss estimates were based on the following comparisons: 1--general appearance of the plants in the wilt-affected area and adjacent healthy plants, 2--stand of plants in wilt-affected and wilt-free areas, 3--number and relative condition of bolls on wilted and non-wilted plants, 4--stage of maturity and condition of foliage of wilted and non-wilted plants.

The symptoms observed in wilt-infected plants varied widely. Apparently internal discoloration is the only consistent symptom. Dwarfing due to shortening of the internodes and leaf mottling resembling mosaic were frequently noted on plants infected with wilt associated with root knot (Heterodera marioni). Stunting was often the most noticeable symptom on plants also suffering from potash deficiency. Vigorously growing plants showed the local triangular leaf lesions usually described as leaf symptoms of wilt. One field of the Clevewilt variety was observed in which about 50 percent of the plants were abnormally dark green with slightly thickened and cupped leaves. When the stems were cut they showed the darkened bundles, but the plants exhibited none of the other symptoms usually described for wilt.

In several fields where root knot was severe but unaccompanied by wilt there were no evident above-ground symptoms. On several occasions plants exhibiting unusual stunting and some wilting and vascular discoloration were submitted to Dr. G. Steiner, who found the roots to be infested with the meadow nematode (Pratylenchus pratensis).

Killing of plants early in the season does not necessarily result in an equivalent loss of crop, since it may act to increase the yield of adjacent plants through increasing the amount of available fertilizer and moisture. Where severe wilt was encountered in what are classified as resistant or tolerant varieties, either root-knot injury was much in evidence or the plants showed symptoms of extreme potash deficiency. Wilt was

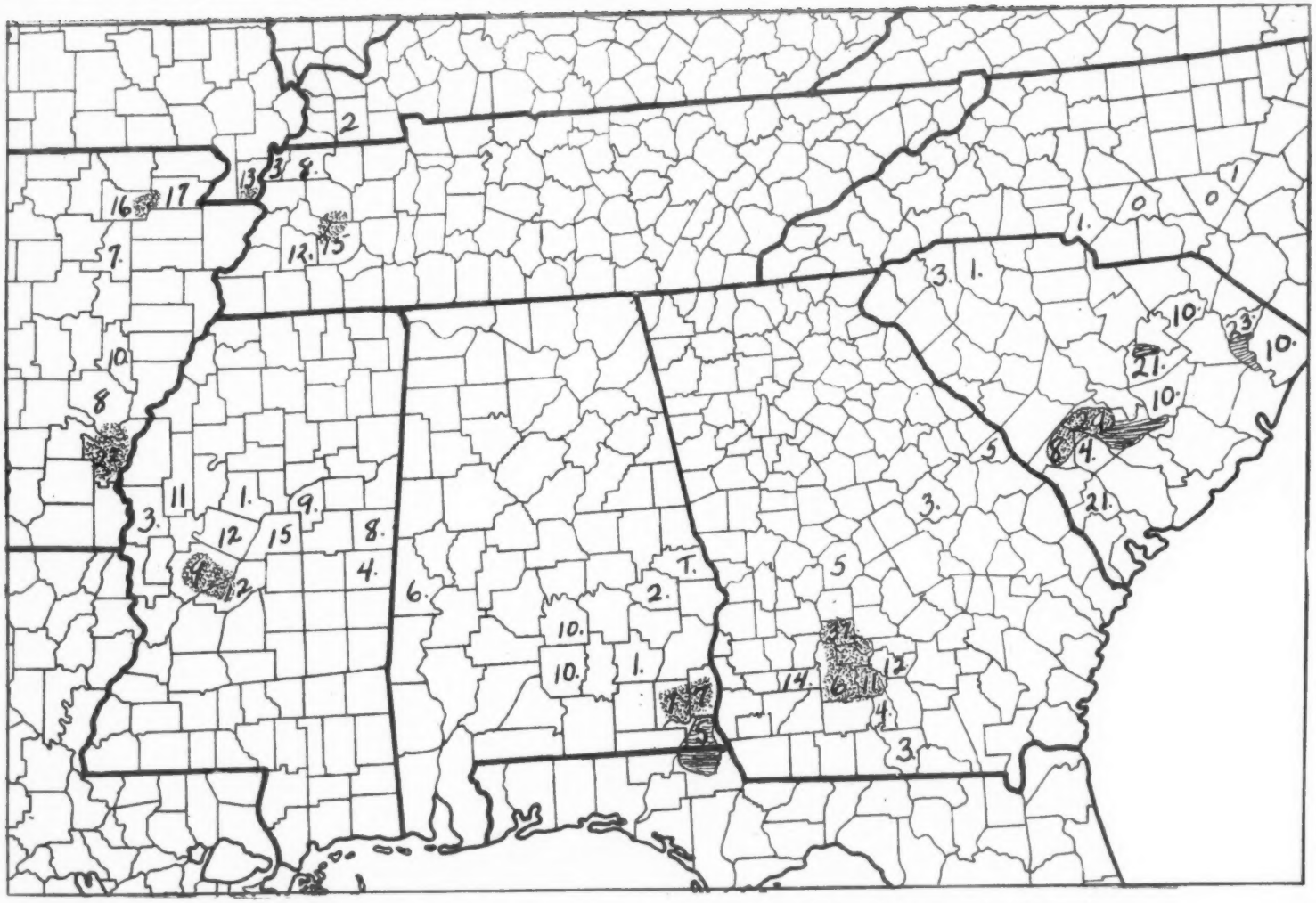


Figure 1. Map showing counties surveyed for cotton wilt. Figures represent estimated percentage wilt. Shading represents approximate areas where potash deficiency (stippling) and magnesium deficiency (lines) were noted as being especially severe.

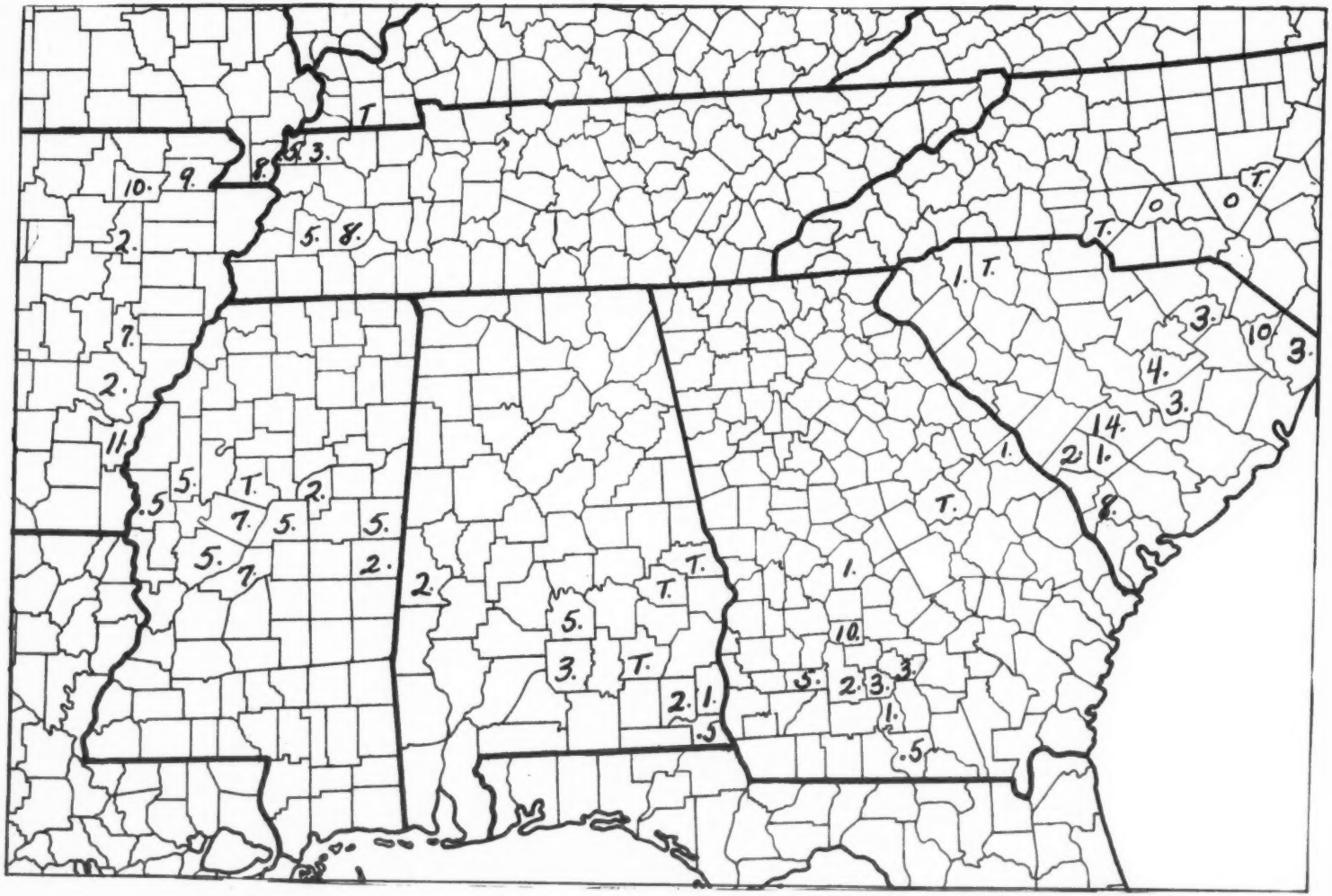


Figure 2. Map showing counties surveyed for cotton wilt. Figures represent estimated percentage loss.

frequently observed locally in areas of either slightly higher or slightly lower elevation than the surrounding portion of the field.

(Division of Mycology and Disease Survey. Chairman, Cotton Disease Survey Committee).

A SURVEY OF COTTON BOLL ROT DISEASES AND THE FUNGI ASSOCIATED WITH THEM

Paul R. Miller

The purpose of this survey was to obtain information regarding the prevalence and relative distribution of the various fungi associated with the boll rots of cotton.

Random samples, each consisting of about 15 bolls, were wrapped singly in cellophane bags or wax paper, placed in cardboard cans provided with tin tops, and sent by mail to the laboratory (South Carolina Agricultural Experiment Station, Clemson, South Carolina) where Dr. R. Weindling and Dr. C. H. Arndt made the identifications of the fungi involved. To the former much credit is due for portions of the material incorporated in this report.

Table 1 shows the number of samples sent in from each State and the individuals who cooperated in collecting the bolls.

Table 1.

State	Number of samples	Collector
Virginia	5	P. R. Miller
North Carolina	27	P. R. Miller
South Carolina	66	C. C. Bennett, John E. Gandy, and P. R. Miller
Georgia	7	P. R. Miller
Mississippi	36	H. A. Edson and L. E. Miles
Total	141	

The extent of the survey and the origin of boll samples are indicated on the map (Fig. 1) which shows the number of samples obtained from different counties in each State.

A total of 1,732 bolls were examined, and microscopic observations of the fungi were made by two methods described below: on 411 bolls by scraping and plating and on 1,321 bolls by either scraping or plating. In the scraping method as used by Arndt, scrapings from the lesions on

Table 2. Frequency of occurrence of fungi expressed in terms of findings on individual bolls.

State	Number of bolls	Organisms Found: By scraping: Number bolls	G.g.	By plating on WA[1]: Number bolls	G.g.	F.m.	F.sp.	Alt.sp.	D.g.	Others
Virginia	52	0	0	52	25	19	11	21	-	8
North Carolina	312	173	91	194	83	30	1	112	-	41
South Carolina	832	510	174	564	256	181	55	249	11	84
Georgia	81	11	2	77	18	20	5	33	0	16
Mississippi	485	314	143	278	62	70	176	38	32	10
Total	1762	1008	410	1165	444	320	248	453	43	159

Table 3. Summary of data presented in Table 2 expressed in terms of percentage.

State	Number of bolls	Organisms Found: By scraping: G.g.	Percentage By plating: G.g.	F.m.	F.sp.	Alt.sp.	D.g.	Others
Virginia	52	- *	48.1	36.5	21.2	40.4	0	15.4
North Carolina	312	52.6	42.8	15.5	0.5	57.7	0	21.1
South Carolina	832	34.1	45.4	32.1	9.8	44.1	1.9	14.9
Georgia	81	18.2	23.4	26.0	6.5	42.9	0	20.8
Mississippi	485	45.5	22.3	25.2	63.3	13.7	11.5	3.6
Total	1762	40.7	38.1	27.5	21.3	38.9	3.7	13.6

* Not examined.

Table 4. Frequency of occurrence of fungi expressed in terms of representation in the sample lots.

State	Scraping: Number of samples examined	G.g.	Plating: Number of samples	G.g.	F.m.	F.sp.	Alt.sp.	D.g.	Others	Scraping and Plating: Number of samples	G.g.
Virginia	0	0	5	5	4	3	5	-	4	5	5
North Carolina	15	15	27	24	16	1	24	-	14	27	26
South Carolina	46	40	66	60	54	28	59	6	42	66	63
Georgia	1	1	7	6	5	4	7	-	5	7	6
Mississippi	26	25	36	26	28	31	17	13	9	36	33
Total	88	81	141	121	107	67	112	19	74	141	133

[1] Abbreviations used in the Tables.

WA = 1.5% tap water agar
G.g. = *Glomerella gossypii*
F.m. = *Fusarium moniliforme*
F. sp. = *Fusarium* sp.
Alt. sp. = *Alternaria* sp.
D.g. = *Diplodia gossypina*

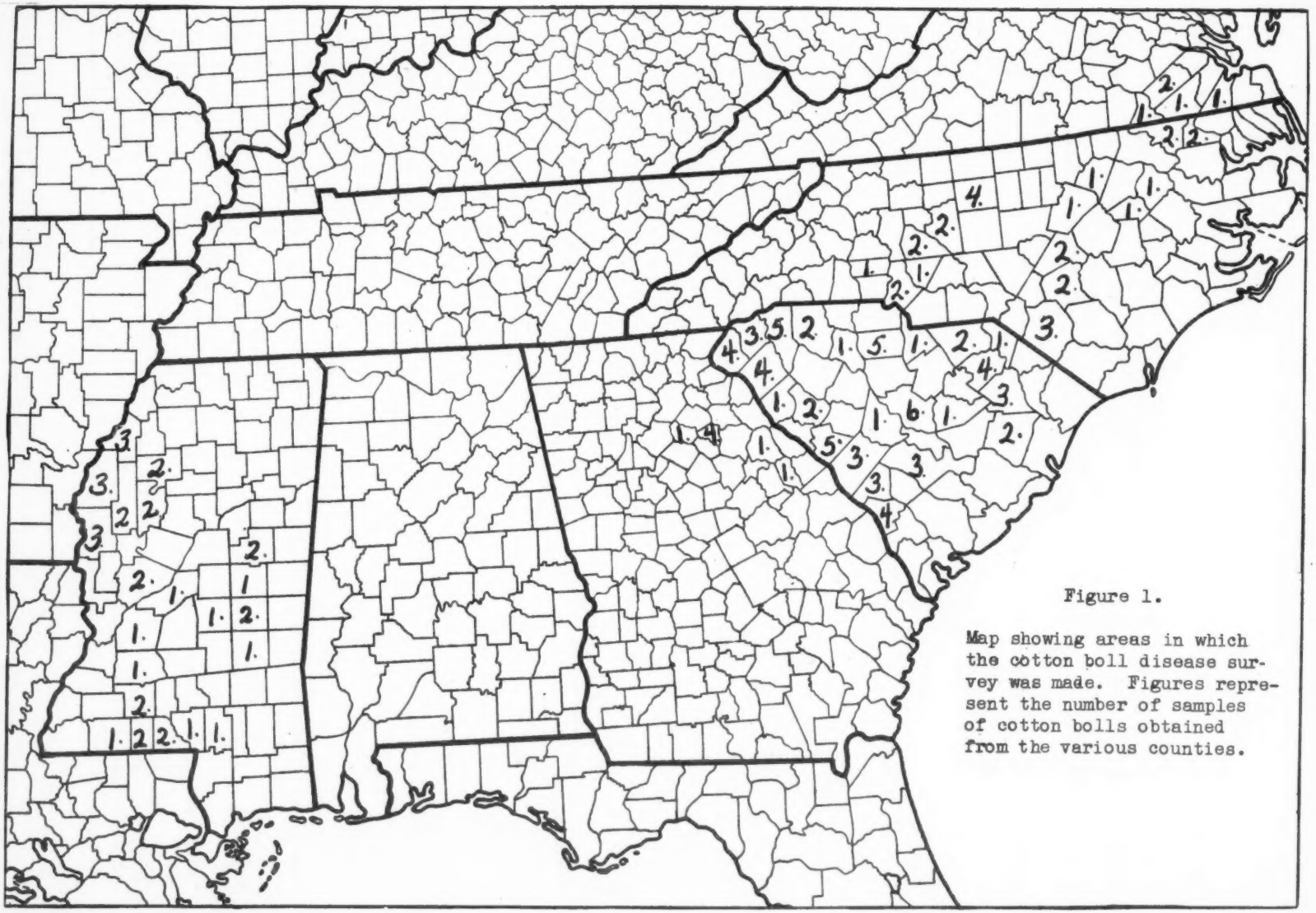


Figure 1.

Map showing areas in which the cotton boll disease survey was made. Figures represent the number of samples of cotton bolls obtained from the various counties.

affected carpels were mounted in drops of water on glass slides and examined for spores of the fungi connected with the boll rots. Where spores were not found on the bolls, scrapings were made of the bracts. All of the platings were made by Weindling who followed Dr. A. J. Ullstrup's method in plating out the seedling fungi. Briefly, it was to cut one or two pieces of about 1/2 x 1 cm. from affected carpels, surface-sterilize for five minutes in a 3% sodium hypochlorite solution, and transfer to Petri dishes containing about 10 cc. of 1.5% water agar. The scraping method proved best for examining fungi present in advanced stages of boll rots, while the plating method was more efficient with spots and recent lesions without fungous spores.

Summary tables 2, 3, and 4 give an account of the number of bolls examined using these methods, and of the frequency with which the various organisms were found. Obviously the totals are too small to be statistically significant; however, they do give some information about the distribution and frequency of the fungi.

Perhaps the most interesting result of this survey is the wide distribution and the frequency of occurrence of Glomerella gossypii -- representing a sequel to the seedling disease survey in the spring of 1938 which showed that this organism occurred 283 times in the 344 fields sampled at random in nine states (P.D.R. 22: 260-264). During the boll-rot survey this fungus was found in 133 out of 141 fields sampled (Table 4). Although climatic conditions this year were unfavorable for boll rots because of extended periods of dry weather, 94 percent of the fields sampled showed some anthracnose, which may explain the wide distribution of this parasite as a cause of damping-off of seedlings. Possibly the epidemiology of boll rots has changed considerably since the pioneer work of Barre and of Edgerton, who also found anthracnose to be a widespread and destructive disease within their respective states in the period 1909 to 1912. The symptoms produced on the majority of the specimens from which the anthracnose fungus was cultured did not conform in general to those described by these investigators, in that the lesions were usually much smaller and they were not sunken and brownish in color with a red border. Very seldom were the moist, pinkish pasty-looking masses of spores as described by them encountered. In fact there is considerable doubt if this disease, in many cases, would have been correctly diagnosed in the field by relying on the usual symptoms. Within the last 30 years the direct and indirect effect of the boll weevil may have helped to change the picture. For instance numerous mature bolls were observed showing initial stages of anthracnose characterized by a water-soaked appearance, and invariably at the center of the lesion weevil or other insect punctures. With the advent of the boll weevil early cotton varieties with an open type of foliage have been introduced, possibly decreasing the destructiveness but not necessarily the prevalence of anthracnose as a boll rot.

Of course one season's results are insufficient to permit general conclusions as to the relative role of various organisms causing diseases of cotton seedlings and bolls; additional similar surveys are needed and present plans provide for their continuance.

(Mycology and Disease Survey. Chairman, Cotton Disease Survey Committee).

ANGULAR LEAF SPOT OF COTTON IN IRRIGATED VALLEYS OF ARIZONA AND NEW MEXICO

C. J. King and R. B. Parker

The angular leaf spot disease caused by Bacterium (Phytomonas) malvacearum E.F.S. has been severe on upland cotton as well as on American-Egyptian in parts of Arizona and New Mexico during recent years. Although it has appeared more generally where abundant summer rains occurred, it has recurred for two or three years to a damaging degree in some areas even when the rainfall was light and in spite of precautions taken by growers to plant disease-free seed. An explanation for this condition may be found in the fact that volunteer seedlings, often numerous after mild winters, may carry enough infection if the previous crop was severely diseased to result in general infection of the new crop. The evidence obtained indicated that rapid spread resulted from the flow of irrigation water applied before these volunteer "carriers" were removed by thinning or cultivations.

In the management of a cotton-seed-treatment experiment conducted at the Sacaton Station for two seasons it was clearly demonstrated that seed that had been acid-delinted, or treated with Ceresan or other mercuric or copper disinfectants rarely carried the disease. However if rows or plots of disease-free seedlings were irrigated with water that had been in contact with diseased seedlings in other parts of the field general infection was likely to occur. To avoid dissemination of infection the writers suggest a thorough clean-up and burning of stalks and plant residues following a season of severe infection; use of disease-free seed; early cultivations to remove volunteer seedlings before the first irrigations; and avoidance of run-off and waste water from other cotton fields.

(U. S. Field Station, Sacaton, Arizona).

APPLE DISEASES IN PENNSYLVANIA

SUMMARY OF APPLE DISEASES IN ALL PARTS OF THE STATE DURING 1938

R. S. Kirby, A. H. Bauer, G. L. Zundel, O. D. Burke, and H. W. Rankin

Treatments or sprays	Number orchards surveyed	Number apples counted	Percentage of diseased apples: **Scab	Brook's spot	Sooty blotch	Blotch	Black rot	Phoma rot	Bitter rot	Apple rust	Brown rot	Black pox	Total
*Completely sprayed	107	42,075	1.43	.31	.83	.03	.05		.11	.002		.08	2.85
Partly sprayed	241	82,255	10.82	1.43	7.4	.13	.11	.01	.31	.03	.01	.72	21.
Unsprayed	50	3,395	82.4	12.3	46.4	2.89	4.3		.08	0	0	2.5	100.
Total number	398	127,725											
Partly sprayed (orchards that did not receive all recommended sprays, material, etc.)													
Timing off	5	950	2.74	3.47	29.4		.42		1.05			.1	37.3
Spraying method off	14	2,175	32.7	5.3	4.28	.04	.12		.48			.04	42.
Substitute materials	32	11,550	4.56	.48	2.14	.034	.04			.043		.02	9.1
One spray omitted	95	32,730	5.2	1.1	5.64	.015	.09		.085	.006	.003	1.27	13.4
Two sprays "	57	17,650	11.62	.76	6.54	.42	.04		.03	.05	.01	.27	19.5
Three " "	28	9,350	15.84	.4	9.9	.01	.18		0	0	0	1.14	27.3
Four " "	18	5,550	23.02	3.86	12.0	.02	.41	.09	.03	.21	0	.43	40.3
Five " "	10	1,525	41.3	5.04	46.0	5.7	.59		0	0	0	.13	98.7
Six " "	3	500	81.6	35.2	41.0	0	.2		0	0	0	0	100.
Summary of one or more sprays omitted	211	67,305	10.28	1.48	8.15	.25	.13	.007	.053	.034	.005	.89	22.22
All sprays applied except the one named (i.e., 5 or 6 applied but the one named was omitted)													
Delayed dormant	19	6,400	3.25	.28	1.05	0	.03		.2	0	.01	.64	5.49
Pre-pink	45	15,800	3.88	1.18	5.7	0	.06		.05	.006	0	1.74	12.6
Pink	10	2,600	8.45	.92	1.19	0	.11		.15	0	0	0	10.8
Petal fall	4	430	9.5	1.15	12.6	0			0	0	0	0	23.
First cover	2	300	2.3	1.	1.6	0			0	0	0	0	5.
Second cover	3	900	2.1	1.3	3.6	0			0	.1	0	0	7.3
Last cover	25	6,275	2.96	1.02	5.37	.08	.16		.05	0	0	0	11.2

* Completely sprayed as per college recommendations as to material, time, number of sprays, etc.

** Scab [Venturia inaequalis], Brook's spot [Mycosphaerella pomi], sooty blotch [Gloeodes pomigena], blotch [Phyllosticta solitaria], black rot [Physalospora obtusa], phoma rot [Phoma sp.], bitter rot [Glomerella cingulata], apple rust [Gymnosporangium juniperi-virginianae], brown rot [Sclerotinia fructicola], black pox [Helminthosporium papulosum].

FIRE BLIGHT IN 1938

FIRE BLIGHT IN PENNSYLVANIA: There was a very severe outbreak of fire blight (Erwinia amylovora) [Bacillus amylovorus] in the east north-central part of Pennsylvania. The accompanying map (Figure 1) shows the

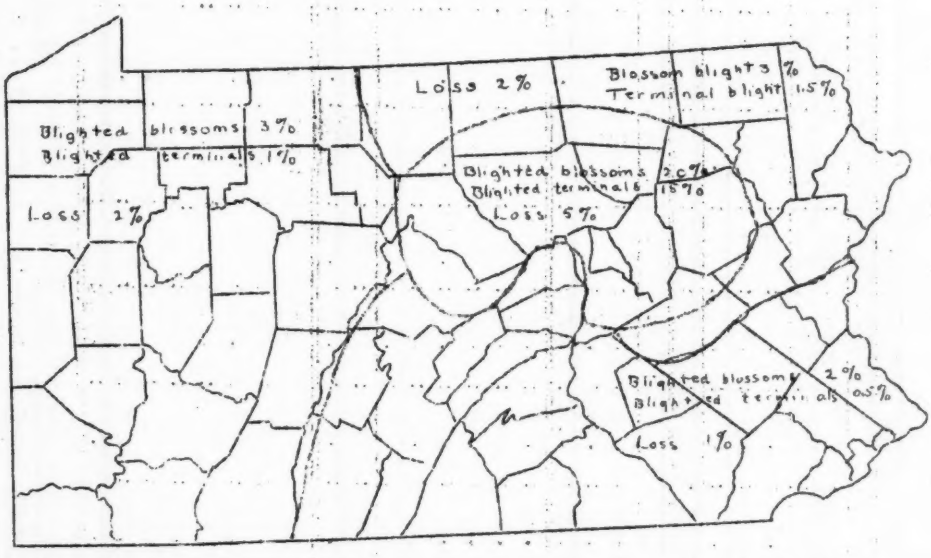


Fig. 1. Average percentages of blossom and terminal blight and estimated loss from fire blight on apple in various parts of Pennsylvania, 1938.

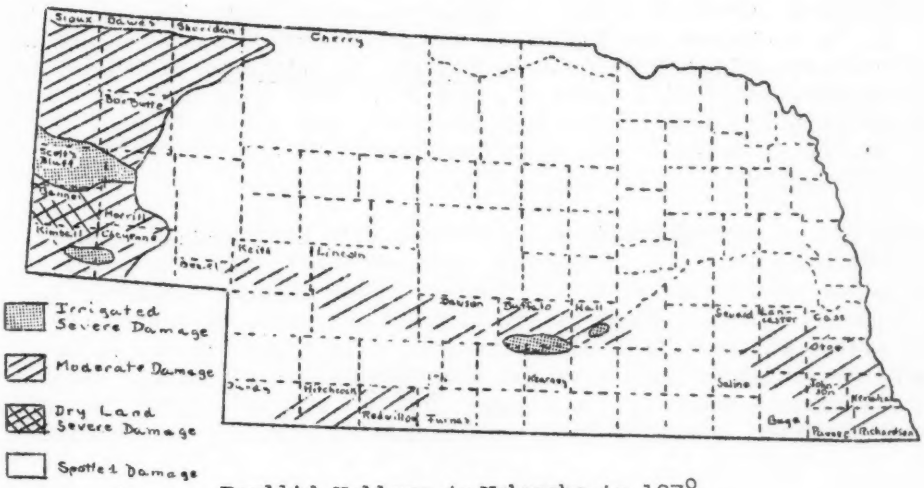
average percentages of blossoms and of terminals blighted, and our estimates of the amount of loss that occurred in this and other regions of the State. The loss for the State as a whole is estimated at 2.5 percent. (R. S. Kirby, A. H. Bauer, H. Rankin, O. D. Burke, G. L. Zundel. Pennsylvania State College).

FIRE BLIGHT IN ILLINOIS IN 1938: The season of 1938 was characterized in Illinois by the unusual prevalence of bacterial diseases, especially those of vegetables. Fortunately, fire blight of apple and pear was confined to a large extent to the northern one-half of the State where there are relatively few large commercial orchards. In the fruit growing sections of western and southern Illinois, less than the average amount of fire blight was observed. Practically no damage from blossom blight was reported, since most of the injury appeared rather late in the season as twig blight. (H. W. Anderson, University of Illinois).

PSYLLID YELLOWS IN NEBRASKA - 1938

James H. Jensen

Psyllid yellows disease of potatoes caused widespread losses in Nebraska's 1938 potato crop. In the western section of the State, where most of the commercial crop is produced, losses in individual fields ranged from none to slight or complete. In the irrigated areas in the western section, this early crop was especially seriously affected. In many cases growers did not dig the crop at all, owing to the low yields of yellows-diseased fields. The late season crop was also damaged in the irrigated section, but many growers were able to cut their losses to a minimum by timely and adequate spraying with lime-sulphur for control of the insects. Re-



Psyllid Yellows in Nebraska in 1938.

duction in yields in dry-land areas in the western section were, as a rule, not as serious as those in irrigated areas. Even in the dry-land areas, however, almost complete losses were suffered in some cases. In slightly affected areas the disease occurred in border rows or at one end of the field in many plantings.

Losses ranged from slight to moderate in the early commercial potato crop section in central Nebraska, where most of the production is under irrigation.

Throughout the remainder of the State, where almost all potatoes are grown in small gardens for home use, the damage varied widely. Some small patches suffered complete loss, some partial losses, usually restricted to border rows or at one end of the field, whereas still other patches apparently were not attacked.

In previous years, psyllid yellows has usually been confined to the western portion of the State, this being the first year the disease has been found as far east as the Missouri River. Plant notes on experimental plots indicate that psyllid yellows occurred at least as early as 1923 in western Nebraska and that there have been outbreaks occurring irregularly since that time. In Nebraska psyllid yellows caused greater losses in 1938 than in any previous year.

(Nebraska Agricultural Experiment Station).

BRIEF NOTES ON PLANT DISEASES

SCLEROTIUM CEPIVORUM FOUND ON GARLIC IN CALIFORNIA: "I wish to report for Dr. W. C. Snyder and Mr. W. H. Lange the occurrence to a serious degree of bulb rot of garlic caused by Sclerotium cepivorum at Moss Beach, San Mateo County, California (June 9), and 75 percent loss caused by the same disease in a field of garlic near San Juan, San Benito County, observed by Dr. J. B. Kendrick and myself on June 16." (M. W. Gardner, University of California. June 21, 1938).

DIPLODIA ON LIGHTNING-INJURED COTTON PLANTS IN GEORGIA: Several cotton fields near Ft. Gaines, Georgia, were observed August 9, 1938, where the majority of the plants in circular areas of about thirty-five feet in diameter showed a peculiar crooking of the tops, with only the uppermost leaves wilted. Samples of the plants were sent to Dr. C. D. Sherbakoff, who obtained pure cultures of Diplodia sp. He thinks this condition is brought about by the fungus invading plants injured but not killed by lightning. (Paul R. Miller, Division of Mycology and Disease Survey).